Some Like it Hot!
Beginning Level

Purpose

To introduce students to the concepts of remote sensing and false colored images. Students create a map based upon temperature, using their hands as remote sensors. The challenge for the students in the project is to determine the location in a given area where an ice cube would melt the fastest and the location where an ice cube would last the longest.

Overview

As a satellite revolves around the Earth it takes pictures with a camera that is sensitive to a variety of different wavelengths. One of the main wave lengths sensed is thermal radiation. The sensor reads the amount of heat being radiated and makes a picture out of the different values. In this activity your students will use their hands as thermal sensors and explore an outside area with a variety of different land cover forms. The students will record the different values on a map of the area, just as a satellite does. When the students are done they will have a thermal map of their area.

Time

Three to five class periods

Level

Beginning

Prerequisites

Prior experience with field sketching is helpful.

A sunny day

Key Concepts

Orbiting satellites take photographs with cameras that are sensitive to a variety of different wavelengths.

One of the main wavelengths sensed is thermal radiation. The sensor reads the amount of heat being radiated and makes a picture out of the different values.

When students observe something without touching it they are actually using their eyes, ears, nose, and skin surface to remotely sense that object.

Skills

Observing a given area

Predicting the area that would melt an ice cube the fastest

Testing their predictions

Comparing different areas for thermal radiance

Mapping a thermal image

Materials and Tools

Ruler

Blank paper

Rope or string

Prism (optional)

Preparation

Classroom setup of bowls of hot water, ice, towels

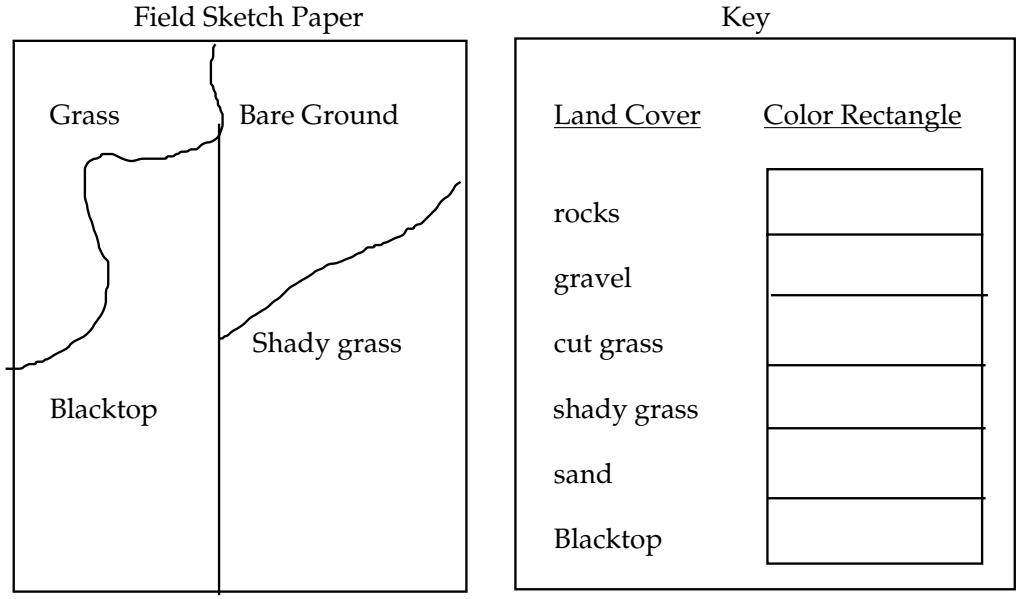
Ice cubes each made from two teaspoons of water

Confine or rope off area of approximately 5 - 10 meter square that contains a variety of land cover types. For example, an area may include blacktop, grass, and bare ground.

What To Do and How To Do It

1. Students should be placed in teams of two. Explain to the students that in a couple of days, they will be taken outside and given an ice cube. They will either be asked to find a location within a given area where they think the ice cube will melt the fastest or a location where they think their ice cube will be protected from melting.
2. Before exploring the outside area, the teacher sets up three to six examples in the classroom (bowl of ice, hot water, warm towel, area of tile floor). Students use their hands cupped downward to determine the relative temperature of each item. (Hands should not touch the item, they are remote sensors). Can they tell the differences between the examples if their eyes are closed?
3. This part of the activity is initiated outdoors in a confined or roped off area (approximate size 5-10 m square). Students will draw a field sketch of the square. On another piece of paper, the students should list the land covers they observe on site. The students should also draw a 12" ruler sized rectangle space reserved on the cover type listings. The teacher asks the class to make a list (or drawings in list form) of no more than 6 different land covers they observe. Some examples are rocks, asphalt, gravel, cut grass, long grass, shady grass, and sand. On the field sketch, the students should record a title for the project, date, time, location, compass directions, weather conditions, and team member names.
4. The students return to the site the following day with their list of land covers and use their hands, as practiced in the classroom, to measure the relative temperature of each land cover type and record this information next to each type of land cover listed so the information is arranged in some way from hottest to coolest.
5. Back in the classroom, the students divide the color rectangle on their key into boxes to represent the number of classes they observed and listed on site (see sample recording sheet). The teacher leads a class discussion over which colors will be used to represent the classes from hot to cold. Exploring and using the colors of the light spectrum as shown by the sun shining through a prism (if available) is suggested for setting color sequence. The teacher records the color sequence for the class to use. They use this sequence to color in the color boxes on the rectangle. (This box is the temperature key for the false colored image). From this chart, the students then complete the false coloring on their maps, coloring the land covers to match the information on the temperature scale.

Figure LAND-L-29: Sample Recording Sheet



6. In preparation for this part of the activity, the teacher makes ice cubes using two teaspoons of water. Ice cubes are taken out just prior to the activity and are wrapped in aluminum foil and placed in a cooler. The coin is tossed to determine whether they will have the challenge of melting the ice cube quickly or protecting the ice cube from melting. Each student team consults their map and chooses the location which best fits their challenge. The class is taken outdoors and each team is given an ice cube (covered with aluminum). They go to the chosen location, and upon a signal from the teacher, place the ice cube (minus the foil) down on the land cover. Upon giving the signal to begin, the teacher starts to record the time. When a students calls out "finished" the teacher gives a time, which the students records on a piece of paper. Students also record their selected location.

7. The teacher makes a table similar to the one below for students to display their results.

   The teacher writes the lowest minute time recorded and then asks the students who had between 1:00 and 1:29, for example, to place their results in the table. The process is repeated until all the data is recorded. A class discussion of the data follows and a new class temperature sensor map is created, showing the actual results of the ice cube activity. (This new map is an essential component for follow-up activities).

Acknowledgement: This is a revised version of the activity *Making an Icy Decision,* created by Lou Lambert for Gaia Crossroads, 1995.

Figure LAND-L-30: Some Like It Hot - Data Table

Group					
Time (min)	:00-:29	:30-:59	1:00-1:29	1:30-1:59	2:00-2:29